

Application No. 10/767,309
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TC Art Unit: 2841
Confirmation No.: 5469

AMENDMENT TO THE CLAIMS

1. (Original) A circuit package, comprising:
a flange;
at least one lead; and
a frame molded to the flange and to the at least one lead;
wherein:
the at least one lead extends through the frame; and
the frame comprises a thermoplastic material having a melting temperature greater than about 340° C.
2. (Original) The circuit package of claim 1, wherein:
the frame includes a key having a key profile;
the flange defines an interlock feature having an interlock profile complementary to the key profile; and
wherein the key is in intimate contact with the interlock feature.
3. (Original) The circuit package of claim 2, wherein the interlock profile is dovetail shaped.
4. (Original) The circuit package of claim 2, wherein the interlock profile is T shaped.

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WEINGARTEN, SCHURGIN,
GARMANIN & LENDOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0010

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5. (Original) The circuit package of claim 2, wherein the interlock profile is L shaped.

6. (Original) The circuit package of claim 2, wherein the interlock feature is a groove in the flange.

7. (Original) The circuit package of claim 2, wherein the interlock feature stands proud of a surface of the flange.

8. (Original) The circuit package of claim 1, wherein:
the at least one lead defines at least one hole therethrough;
and
a portion of the thermoplastic frame material extends through the hole.

9. (Original) The circuit package of claim 8, wherein the at least one hole is rectangular.

10. (Original) The circuit package of claim 8, wherein the at least one hole comprises a plurality of holes.

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11. (Original) The circuit package of claim 8, wherein, in a lateral cross-section of the at least one lead and passing through the at least one hole, a cross-sectional area of the at least one hole is less than or equal to about 25% of a cross-sectional area of the at least one lead.

12. (Original) The circuit package of claim 1, wherein:

the at least one lead includes a retention feature proximate to one end thereof, the retention feature having an outward-facing portion; wherein

a portion of the thermoplastic frame material abuts the outward-facing portion of the retention feature.

13. (Original) The circuit package of claim 12, wherein the retention feature comprises a hooked edge.

14. (Original) The circuit package of claim 12, wherein the retention feature comprises a ridge.

15. (Original) The circuit package of claim 12, wherein the retention feature comprises a groove.

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WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

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16. (Original) The circuit package of claim 1, wherein:

the at least one lead includes a retention feature proximate to one end thereof; wherein

a portion of the thermoplastic frame material abuts the retention feature.

17. (Original) The circuit package of claim 16, wherein the retention feature is a hooked edge.

18. (Original) The circuit package of claim 16, wherein the retention feature is a ridge.

19. (Original) The circuit package of claim 16, wherein the retention feature is a groove.

20. (Original) The circuit package of claim 1, wherein the flange comprises a convex bottom surface.

21. (Original) The circuit package of claim 20, wherein the convexity of the bottom surface is at least about 0.0001 inches.

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22. (Original) The circuit package of claim 20, wherein the convexity of the bottom surface is between about 0.0005 and about 0.0010 inches.

23. (Currently Amended) The circuit package of claim 1, wherein the flange comprises at least about 50% copper.

24. (Currently Amended) The circuit package of claim 1, wherein the flange comprises at least about 90% copper.

25. (Original) The circuit package of claim 1, wherein the flange comprises at least about 98% copper.

26. (Original) The circuit package of claim 1, wherein the flange comprises an alloy of copper and at least one material chosen from a group comprising zirconium and silver.

27. (Original) The circuit package of claim 26, wherein the alloy contains at least about 98% copper.

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WEINGARTEN, SCHEURIN,
GAGNEBIN & LEBOVITZ LLP
TEL. (617) 542-2200
FAX. (617) 451-0313

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28. (Original) The circuit package of claim 1, wherein the flange comprises:

between about 0.05% and about 1.5% zirconium; and
at least about 98.5% copper.

29. (Original) The circuit package of claim 1, wherein the flange comprises:

between about 0.05% and about 1.5% zirconium; and
the balance copper.

30. (Original) The circuit package of claim 1, wherein the flange comprises:

at about 0.085% silver; and
at least about 99.9% copper.

31. (Original) The circuit package of claim 1, wherein the at least one lead comprises at least 50% copper.

32. (Currently Amended) The circuit package of claim 1, wherein the at least one lead comprises at least about 97% copper.

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33. (Original) The circuit package of claim 1, wherein the at least one lead comprises an alloy of copper and at least one material chosen from a group comprising iron, phosphorus, zinc, zirconium, cobalt, tin, magnesium, nickel, chromium, titanium and silicon.

34. (Currently Amended) The circuit package of claim 33, wherein the alloy contains at least about 97% copper.

35. (Currently Amended) The circuit package of claim 1, wherein the at least one lead comprises:

between about 2.1% and about 2.6% iron;

between about 0.015% and about 0.15% phosphorous;

between about 0.05% and about 0.2% zinc; and

the balance copper.

36. (Original) The circuit package of claim 1, wherein the thermoplastic material comprises a liquid crystal polymer.

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37. (Original) The circuit package of claim 2, wherein the liquid crystal polymer comprises:

para-hydroxybenzoic acid;
bisphenol; and
phthalic acid.

38. (Original) The circuit package of claim 2, wherein the liquid crystal polymer comprises:

a copolymer of p-hydroxybenzoic acid; and
6-hydroxy-2-naphthoic acid.

39. (Original) The circuit package of claim 2, wherein the liquid crystal polymer comprises terpolymers of formulation hydroxybenzoic acid, 4-4-bisphenol and terephthalic acid.

40. (Currently Amended) The circuit package of claim 1, wherein the thermoplastic material has a coefficient of thermal expansion within about 60% of a coefficient of expansion of the at least one lead.

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41. (Original) The circuit package of claim 1, wherein the thermoplastic material has a coefficient of thermal expansion of between about 7 ppm/°C and 22 ppm/°C.

42. (Original) The circuit package of claim 1, wherein the thermoplastic material comprises between about 30% and about 45% talc balls between about 2 and about 3 microns in diameter.

43. (Original) The circuit package of claim 1, wherein the thermoplastic material comprises between about 30% and about 50% glass fiber.

44. (Original) The circuit package of claim 1, wherein the thermoplastic material comprises a plurality of graphite flakes.

45. (Original) The circuit package of claim 44, wherein the thermoplastic material comprises between about 10% and about 70% graphite flakes.

46. (Original) The circuit package of claim 44, wherein the thermoplastic material comprises between about 40% and about 50% graphite flakes.

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WEINGARTEN, SCHURGIN,
GAGNEBIN & LESOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

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47. (Original) The circuit package of claim 44, wherein the graphite flakes form a plurality of layers.

48. (Original) The circuit package of claim 47, wherein the graphite flakes are oriented parallel to a selected surface of the frame.

49. (Original) The circuit package of claim 1, further comprising a thermoplastic material lid attached to the frame.

50. (Original) The circuit package of claim 49, wherein the flange, the frame and the lid define an air cavity.

51. (Original) The circuit package of claim 49, wherein the lid is welded to the frame.

52. (Original) The circuit package of claim 49, wherein the thermoplastic material comprises a liquid crystal polymer.

53. (Original) The circuit package of claim 52, further comprising a semiconductor die attached to the flange and electrically bonded to the at least one lead.

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WFRINGARTEN, SCHURGIN,
GAGNEBIN & IERROVITI LLP
TEL. (617) 542-2280
FAX. (617) 451-0313

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54. (Original) The circuit package of claim 52, wherein the thermoplastic material comprises a plurality of graphite flakes.

55. (Original) The circuit package of claim 54, wherein the thermoplastic material comprises between about 10% and about 70% graphite flakes.

56. (Original) The circuit package of claim 54, wherein the thermoplastic material comprises between about 40% and about 50% graphite flakes.

57. (Original) The circuit package of claim 1, further comprising a semiconductor die attached to the flange and electrically bonded to the at least one lead.

58. (Original) The circuit package of claim 1:

wherein the frame comprises an edge adjacent a surface of the flange; and

further comprising a seal attached to the frame and to the flange along at least a portion of the edge.

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59. (Original) The circuit package of claim 58, wherein the seal comprises epoxy.

60. (Original) The circuit package of claim 58, wherein the seal comprises silicone.

61. (Original) The circuit package of claim 1:

wherein the frame comprises a first edge adjacent a first surface of the at least one lead; and

further comprising a first seal attached to the frame and to the at least one lead along at least a portion of the first edge.

62. (Original) The circuit package of claim 61:

wherein the frame comprises a second edge adjacent a second surface of the at least one lead; and

further comprising a second seal attached to the frame and to the at least one lead along at least a portion of the second edge.

63. (Original) The circuit package of claim 62:

wherein the frame comprises a third edge adjacent a surface of the flange; and

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further comprising a third seal attached to the frame and to the flange alone at least a portion of the third edge along.

64. (Original) The circuit package of claim 63, wherein the seal comprises epoxy.

65. (Original) The circuit package of claim 63, wherein the seal comprises silicone.

66. (Currently Amended) The circuit package of claim 63, wherein the seal comprises a material having:

a thixotropic index between about 3.5 and about 4.6;

a cason viscosity between about 7.4 and about 3 Pa.s;

a viscosity between about 58 and about 125 Pa.s at a shear rate of about 0.95 per second; and

a viscosity between about 12 and about 30 Pa.s at a shear rate of about 9.5 per second.

67. (Original) The circuit package of claim 1, further comprising a moisture barrier film on a surface of the frame.

68-171. (Canceled)